

## CLAIMS:

1. A contour filter for providing contour information from an array of pixel values representing an image, said array comprising a first and a second group of pixels, the first group (G) of pixels representing part(s) of the image optically filtered with a filter having a first color, and the second group (R/B) of pixels representing part(s) of the image optically filtered with one or more filters having one or more second colors, each pixel in the first group having a vertical and a horizontal neighboring pixel of the second group, said filter comprising:

means (ZSB) for converting said array of pixel values to a zero switched array, where the pixel values of the pixels in the second group are replaced by zero,

means (7) for contour filtering said zero switched array and outputting said contour information, the filtering means comprising:

means for, for each pixel in the zero switched array, defining a sub array in the array of pixels where the pixel to be filtered is positioned in a pre-determined position within the sub array;

a first array of filter coefficients for use in the filtering means when the pixel to be filtered is a pixel from the first group of pixels, and a second array of filter coefficients for use in the filtering means when the pixel to be filtered is a pixel from the second group of pixels, the first and second arrays having the same dimensions as the sub array and fulfilling a set of rules comprising the filter coefficient being zero at the predetermined position, and when dividing the filter coefficients of the array into a number of disjoint groups of diagonal coefficients where said disjoint groups are symmetrical around a center coefficient of the array, a filter coefficient exists in each group which equals the sum of the remaining filter coefficients in said group; and

means for calculating a filtered pixel value, said calculation being performed by multiplying each coefficient in said first or second array of filter coefficients with each correspondingly placed pixel in said sub array from either said first or second group of pixels and adding the result of each multiplication to obtain a filtered pixel value for each of said sub arrays of pixels.

2. A contour filter for providing contour information from an array of pixel values representing an image, said array comprises a first and a second group of pixels, the first group of pixels representing part(s) of the image optically filtered with a filter having a first color, and the second group of pixels representing part(s) of the image optically filtered with one or more filters having one or more second colors, each pixel in the first group having a vertical and a horizontal neighboring pixel of the second group, said filter comprising:

means for converting said array of pixel values to a zero switched array, where the pixel values of the pixels of the second group are replaced by zero,

means for contour filtering said zero switched array and outputting said contour information, the filtering means comprising:

means for, for each pixel in the zero switched array, defining a sub array in the array of pixels where a pixel to be filtered is positioned in a pre-determined position within the sub array;

a first array of filter coefficients for use in the filtering means when the pixel to be filtered is a pixel from the first group of pixels, and a second array of filter coefficients for use in the filtering means when the pixel to be filtered is a pixel from the second group of pixels, the first and second arrays having the same dimensions as the sub array and fulfilling the rule that the sum of coefficients in a subgroup comprising every second row of said array of filter coefficients is zero and each filter coefficient not being a part of said subgroup is between -0.1 and 0.1, preferably 0; and

means for calculating a filtered pixel value, said calculation being performed by multiplying each coefficient in said first or second array of filter coefficients with each correspondingly placed pixel in said sub array from either said first or second group of pixels and adding the result of each multiplication to obtain a filtered pixel value for each of said sub arrays of pixels.

3. A contour filter according to claim 1 or 2, wherein said sub array has an odd number of rows and columns and said pre-determined position of said pixel to be filtered is in the center of said sub array.

4. A contour filter according to claim 1 or 2, further comprising means for performing an interpolation of missing color pixels in parallel with the filtering.

5. A contour filter according to claim 1 or 2, further comprising means for matching noise of two separate filters comprising each of the first and second filter coefficients.

6. A contour filter according to claim 5, wherein the matching means are adapted to perform the matching by adjusting the coring level of each of the filters.

7. A contour filter according to claim 1 or 2, wherein:  
the first group of pixels consists of every second pixel in each row and column  
of the array of pixel values, and

the first and second filter arrays are combined to a single filter array where:

- the first and second arrays have the same dimensions,
- for each position of the first and second arrays, apart from the predetermined position, at least one of the first and second array has a filter coefficient being at least substantially zero,
- the single array having dimensions equal to those of the first and second arrays, and
- the filter coefficient of each position of the single array being the sum of the corresponding coefficients of the first and second arrays.

8. A contour filter according to claim 7, said filter being a 5x2 filter, the coefficients of which having mutual ratios being substantially defined by:

$$\begin{array}{cccccc} -x \pm A & -x \pm B & 0 \pm C & -x \pm D & -x \pm E \\ -x \pm F & -x \pm G & 0 & -x \pm H & -x \pm I \end{array}$$

or a 5x3 filter the coefficients of which having mutual ratios being substantially defined by:

$$\begin{array}{cccccc} -2x \pm A & -3x \pm B & -2x \pm C & -3x \pm D & -2x \pm E \\ -6x \pm F & -6x \pm G & 0 & -6x \pm I & -6x \pm J \\ -2x \pm K & -3x \pm L & -2x \pm M & -3x \pm N & -2x \pm O \end{array}$$

or a 5x5 filter the coefficients of which having mutual ratios being substantially defined by:

$$\begin{array}{cccccc} -x \pm A & -2x \pm B & -2x \pm C & -2x \pm D & -x \pm E \\ -2x \pm F & -3x \pm G & -2x \pm H & -3x \pm I & -2x \pm J \\ -2x \pm K & -2x \pm L & 0 & -2x \pm M & -2x \pm N \\ -2x \pm O & -3x \pm P & -2x \pm Q & -3x \pm R & -2x \pm S \\ -x \pm T & -2x \pm U & -2x \pm V & -2x \pm X & -x \pm Y \end{array}$$

or a 5x5 filter the coefficients of which having mutual ratios being substantially defined by:

$$\begin{array}{ccccc} -x \pm A & -3x \pm B & -2x \pm C & -3x \pm D & -x \pm E \\ -3x \pm F & -3x \pm G & 0 \pm H & -3x \pm I & -3x \pm J \\ -2x \pm K & 0 \pm L & 0 & 0 \pm M & -2x \pm N \\ -3x \pm O & -3x \pm P & 0 \pm Q & -3x \pm R & -3x \pm S \\ -z \pm T & -3x \pm U & -2x \pm V & -3x \pm X & -x \pm Y \end{array}$$

or a 5x5 filter the coefficients of which having mutual ratios being substantially defined by:

$$\begin{array}{ccccc} -x \pm A & -2x \pm B & -x \pm C & -2x \pm D & -x \pm E \\ -2x \pm F & -2x \pm G & 0 \pm H & -2x \pm I & -2x \pm J \\ -x \pm K & 0 \pm L & 0 & 0 \pm M & -x \pm N \\ -2x \pm O & -2x \pm P & 0 \pm Q & -2x \pm R & -2x \pm S \\ -x \pm T & -2x \pm U & -x \pm V & -2x \pm X & -x \pm Y \end{array}$$

5 or a 5x5 filter the coefficients of which having mutual ratios being substantially defined by:

$$\begin{array}{ccccc} -0 \pm A & -1x \pm B & -2x \pm C & -1x \pm D & -0 \pm E \\ -1x \pm F & -0 \pm G & +2x \pm H & -0 \pm I & -1x \pm J \\ -2x \pm K & +2x \pm L & +8x \pm M & +2x \pm N & -2x \pm O \\ -1x \pm P & -0 \pm Q & +2x \pm R & -0 \pm S & -1x \pm T \\ -0 \pm U & -1x \pm V & -2x \pm X & -1x \pm Y & -0 \pm Z \end{array}$$

where x is a real number and the value of each of A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, X, Y, Z is substantially smaller than x, preferably between 0 and 0.1x.

- 10 9. A method for providing the contour information from an array of pixel values representing an image, said array comprises a first and a second group of pixels, the first group of pixels representing parts of the image optically filtered with a filter having a first color, and the second group of pixels representing parts of the image optically filtered with one or more filters having one or more second colors, each pixel in the first group having a vertical and horizontal neighboring pixel of the second group, the method comprising:

15 converting said array of pixel values to a zero switched array, where the pixel values of the pixels in the second group are replaced by zero,

contour filtering said zero switched array and outputting said contour information, the filtering comprising the steps of:

- 20 defining, for each pixel in the zero switched array, a sub array in the array of pixels where a pixel to be filtered is positioned in a pre-determined position within the sub array;

using a first array of filter coefficients when the pixel to be filtered is a pixel from the first group of pixels, and a second array of filter coefficients when the pixel to be filtered is a pixel from the second group of pixels, the first and second arrays having the same dimensions as the sub array and fulfilling a set of rules comprising the filter coefficient being zero at the predetermined position, and when dividing the filter coefficients of the array into a number of disjoint groups of diagonal coefficients where said disjoint groups are symmetrical around a center coefficient of the array, a filter coefficient exists in each group which equals the sum of the remaining filter coefficients in said group; and

calculating a filtered pixel value, said calculating being performed by multiplying each coefficient in said first or second array of filter coefficients with each correspondingly placed pixel in said sub array from either said first or second group of pixels and adding the result of each multiplication to obtain a filtered pixel value for each of said sub arrays of pixels.

10. A method for providing the contour information from an array of pixel values representing an image, said array comprises a first and a second group of pixels, the first group of pixels representing parts of the image optically filtered with a filter having a first color, and the second group of pixels representing parts of the image optically filtered with one or more filters having one or more second colors, each pixel in the first group having a vertical and horizontal neighboring pixel of the second group, said method comprising:

converting said array of pixel values to a zero switched array, where the pixel values of the pixels in the second group are replaced by zero,

contour filtering said zero switched array and outputting said contour information, the filtering comprising:

defining, for each pixel in the zero switched array, a sub array in the array of pixels where a pixel to be filtered is positioned in a pre-determined position within the sub array;

using a first array of filter coefficients when the pixel to be filtered is a pixel from the first group of pixels, and a second array of filter coefficients when the pixel to be filtered is a pixel from the second group of pixels, the first and second arrays having the same dimensions as the sub array and fulfilling the rule that the sum of coefficients in a subgroup comprising every second row of said array of filter coefficients is zero and each filter coefficients not being a part of said subgroup is between -0.1 and 0.1, preferably 0; and

calculating a filtered pixel value, said calculating being performed by multiplying each coefficient in said first or second array of filter coefficients with each correspondingly placed pixel in said sub array from either said first or second group of pixels and adding the result of each multiplication to obtain a filtered pixel value for each of said sub arrays of pixels.

11. A computer program comprising computer program code means adapted to perform all the steps of claim 9 or 10 when said program is run on a computer.

12. A computer readable medium comprising a computer program as claimed in claim 11.

13. A color camera, comprising:  
a sensor (S) having a color filter array; and  
a contour filter (7) as claimed in claim 1.